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THE IMPACT OF HEALTH SUPPLY AND DEMAND ON HEALTH OUTCOMES IN PRIMARY HEALTH CARE SERVICES: PANEL DATA ANALYSİS

Birinci Basamak Sağlık Hizmetlerinde Sağlık Arz ve Talebinin Sağlık Sonuçları Üzerindeki Etkisi: Panel Veri Analizi

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Primary Health Care Services, Health Supply, Health Demand, Health Economics, Cointegration Test.

ABSTRACT

The aim of this study is to determine the impact of health supply and demand on health outcomes in primary health care services. For this purpose, the population of the study consists of the Eastern Anatolia Region. Sampling was not determined in the study, and data from 14 provinces in the region were evaluated. The dependent variable of the study is the number of deaths, while the independent variables are the number of family medicine units and the number of primary care applications. The research data were tested separately for each province considering the time period 2012-2021. According to the results of the study, the increase in the number of family medicine units leads to a decrease in the number of deaths in Erzurum, Van and Ağrı, as in the whole panel. On the other hand, the increase in the number of primary care visits decreases the number of deaths in Muş and Hakkari, but increases it in Malatya and Bitlis.

Anahtar Kelimeler
Temel Sağlık Hizmetleri, Sağlık Arzı, Sağlık Talebi, Sağlık Ekonomisi, Eşbütünleşme Testi.

ÖZ

Bu çalışmanın amacı, birinci basamak sağlık hizmetlerinde sağlık arz ve talebinin sağlık sonuçları üzerindeki etkisini belirlemektir. Bu amaçla araştırmanın evrenini Doğu Anadolu Bölgesi oluşturmaktadır. Çalışmada örneklem belirlenmemiş, bölgede yer alan 14 ile ilişkin veriler değerlendirilmiştir. Araştırmanın bağımlı değişkeni ölüm sayısı, bağımsız değişkenleri aile hekimliği birimi sayısı ve birinci basamak başvuru sayısıdır. Araştırma verileri 2012-2021 zaman periyodu göz önünde bulundurularak her bir il için ayrı ayrı test edilmiştir. Çalışmanın sonuçlarına göre, aile hekimliği birimlerinin sayısındaki artış, tüm panelde olduğu gibi Erzurum, Van ve Ağrı'da da ölüm sayılarında azalmaya neden oluyor. Öte yandan, birinci basamak ziyaret sayısındaki artış Muş ve Hâkkari'de ölüm sayısını azaltırken, Malatya ve Bitlis'te artırmaktadır.

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1. Introduction

Primary healthcare services are of great importance as they constitute the starting point of healthcare services as well as their role in diagnosis and treatment. In this direction, there have been many changes and transformations in primary health care services in the historical process. The most recent development among the arrangements in primary health care services, which is still used today, is the family medicine model. In this context, with the family medicine model, which was started to be implemented in line with the Health Transformation Program, differences have occurred in the provision of primary health care services.

In line with the family medicine model, access to primary health care services has become easier and everyone is under the responsibility of a family physician. In this regard, family physicians observe the health conditions of the people under their responsibility and guide them. In this way, it is aimed to provide early diagnosis and treatment for the current health status of individuals and the health risks they may face.

Although the objectives are common in primary health care services, differences may occur in health outcomes. In addition to socio-demographic and socio-cultural characteristics, different factors may also play a role in these differences. In this context, concepts such as developing technology, increasing use of social media, media platforms for health services, health literacy and the definition of health may be among these factors.

Individuals play the most important role in shaping health services. Ultimately, individuals manage their health conditions themselves. In line with the way they manage their health conditions, utilization of primary health care services can have an impact on health outcomes. This situation shows the importance of individuals' applications to primary health care services. On the other hand, there are thoughts that the number of family physicians and thus easier access to family health centers may also have an impact on health outcomes. Accordingly, the aim of this study is to determine the impact of supply and demand in primary health care services on mortality. In addition, making interpretations and evaluations about the provinces in line with the analyzes made within the scope of each province are among the sub-objectives of the study.

1.1. Primary Health Care Services

Primary health care can be defined as a coordinated service for the benefit of public health, with a special focus on facilitating access to and utilization of services. With this characteristic, primary health care can be considered as a subsystem in the overall health system (Kringos et al., 2015). In other words, primary health care services can be defined as the first health institution to which people apply as a result of various health problems, as well as diagnostic, therapeutic and rehabilitative health services and all services provided for the health of the community (Ministry of Health, 2004: 43).

Primary health care services basically incorporate some characteristics. These features can be expressed as follows (Başer et al., 2015: 27);

- Being the first point of contact for health services,
- Promote patient-centered care in a long-term or continuous manner, as opposed to illness-centered care,
- The inclusiveness of its structure,
- Establishing coordination between teams.

In primary health care services, family physicians evaluate the health status of individuals under their responsibility with a holistic approach, taking into account their living conditions and their relations with the environment. In addition to this holistic approach, they apply the diagnosis and treatment method with the active participation of the patient and provide them with the necessary health instructions (Üstün & Cezlan, 2021: 354). Primary healthcare services are financed by the General Health Insurance and provided free of charge to everyone (Kara and Öztürk, 2021: 9).

According to the World Organization of Family Physicians, family medicine is defined as a scientific discipline and clinical specialty with evidence-based clinical practice and unique educational content and research. In addition, according to the organization, family medicine consists of six core competencies. These competencies (Üstün & Cezlan, 2021: 354);

- Primary care management,
- Person-centered care,
- Authentic problem solving skills
- Comprehensive approach,
- Community orientation,

- Holistic approach-modeling.

The health of all people in the family, from the baby in the womb to the oldest person, is the responsibility of the family physician (Üstün & Cezlan, 2021: 354). While providing healthcare services, the family physician does not discriminate between individuals based on socio-demographic and socio-cultural characteristics (Üstün & Cezlan, 2021: 354). The family physician continuously monitors the health status of the people under his/her care not only when they are sick but also during the period when they are healthy (Ak, 2010).

Family physicians have the characteristic of being the first place of application for access to health services. In addition, family physicians have a gatekeeper role in the transition process to health institutions at other levels of health services (Starfield, 1988). In line with the gatekeeper role, family physicians can direct patients and contribute to the correct functioning of the referral system.

With the correct functioning of the referral system, most health problems can be solved by family physicians. In this way, crowding that may occur in other health institutions can be prevented and resources can be used efficiently (Üstün & Cezlan, 2021: 354).

The capitut system was first introduced in health services in 1961 in the Law No. 224 on the Socialization of Health Services. In 2003, with the transformation in health services, the capitated system was brought back to the agenda and was at the forefront of the "effective, gradual referral chain", which was among the goals of the Health Transformation Program (Yılmaz 2009; Turkish Medical Association 2018). However, due to various reasons, changes have occurred in the family medicine model in the following period.

Family medicine, which started as a pilot practice in Düzce in 2005, has been implemented in all provinces as of 2011. On the other hand, various criticisms have been made against the family medicine model. Among these criticisms are the undermining of preventive, egalitarian and accessible health services provided by health centers, which were strengthened as a result of the socialization of health, and the devaluation of the labor of physicians through performance-based payments and flexible working systems (Yılmaz 2009; Turkish Medical Association 2018).

On the other hand, it is also among the criticisms that the strengthened provision of primary health care services, which was among the objectives of the Health Transformation Program in line with the family medicine model, could not be realized due to the fragmentation of primary health care services (Türk Tabipleri Birliği 2018).

As a result of the aforementioned issues, the Health Transformation Program's goal for the capitation model was not achieved. In Turkey, the capitated referral system was piloted in Denizli and Isparta in 2008. However, during the pilot implementation period, it was stated that the referral chain caused an increase in the workload of family physicians and created obstacles for patients to benefit from secondary health care services efficiently (Turkish Medical Association, 2008). As a result of these issues, the chain of referral model was abolished 15 days after its implementation (Bektemür et al. 2018; Bulut and Uğurluoğlu, 2018).

After mentioning the concepts related to the subject, it is important to examine the studies conducted in this field in terms of the integrity of the study. The studies conducted in this direction are summarized as follows.

Özkara (2006) investigated the place and importance of patient satisfaction in primary health care services in health economy. According to the results of the study, when primary health care institutions are used properly, the need for health services can mostly be met. On the other hand, this will reduce the congestion, burden, costs and unnecessary use of technology in secondary health care institutions. In addition, it was concluded that directing patients to secondary health care services and various improvements to be made in primary health care institutions (specialist doctor, laboratory services) play an important role in their satisfaction.

Gezer Çerit (2007) investigated the satisfaction of Roma citizens applying to primary health care institutions in Kırıklareli and the staff providing services to them. According to the results obtained, it was determined that both Roma and non-Roma people were satisfied with the services they received from health institutions. On the other hand, 'Immunization Services' ranks first in the difficulties experienced by health personnel providing services to Roma people. In addition, health personnel who do not provide services to Roma people have fewer problems compared to those who provide services.

Çubukçu (2008) evaluated the satisfaction of patients applying to primary health care organizations in Samsun. According to the results of the study, the statement with the highest score in patient satisfaction was 'listening to you', while the statement with the lowest score was 'providing fast service for urgent health problems'. In addition, a negative correlation was found between the education level variable and patient satisfaction.

Mutlupoyraz (2010) investigated the satisfaction levels of patients applying to primary health care institutions and the job satisfaction of physicians operating in these institutions. The study conducted in Adana was conducted at two different times, before the implementation of family medicine and in the twelfth month of the implementation. According to the results of the study, the most important factors in patient satisfaction were physicians' prior knowledge about patients, preparation for referral and telephone access to physicians. Among the results of the study, it was found that the highest increase in physicians' job satisfaction was the salary received, and the lowest increase was the state of being constantly busy.

Yıldız (2016) investigated the follow-up and treatability of patients admitted to various outpatient clinics (ear, nose, throat, physical therapy and rehabilitation, dermatology) of a tertiary education and research hospital. According to the specialty physicians, 44.3% of all patients and 43.2% of the patients according to the family medicine researcher can be evaluated in primary health care institutions. It was determined that 86.9% of these patients were the same patient. On the other hand, contrary to the current opinions of physicians, 73.6% of patients think that they cannot be evaluated in primary health care institutions.

Gökçe (2017) investigated the level of knowledge and behavior of patients applying to primary health care institutions regarding antibiotic use. According to the results of the study, it was determined that utilization of information sources and education level were the most effective on antibiotic use of patients. In addition, it was also found that individuals who obtained direct information from the doctor had higher levels of knowledge about antibiotic use and more positive behaviors.

Deniz (2018) analyzed the accessibility of family health centers with GIS. According to the study conducted in Uşak, considering the 500-meter distance determined by law, all buildings in a neighborhood are outside the criteria. In addition, among the neighborhoods included in the study, there are high level problems regarding access in neighborhoods other than Özdemirler neighborhood.

Özer (2018) tried to determine the factors affecting drug use, social support status, anxiety and depression risk in patients using multiple drugs in primary care. According to the results obtained, it was determined that the risk of depression and anxiety was statistically more significant in people with low education level, women, individuals without a spouse and those under the age of 65.

Akpınar (2019) investigated the effect of health literacy level on the use of primary health care services in adult patients. According to the results of the study, it was determined that the health literacy rate of people who stated that they would first apply to the emergency room in case of illness was 11.8%. It was concluded that this rate was the lowest rate among the groups evaluated.

Görgü (2020) investigated the expectations of patients benefiting from primary health care services towards joint decision-making in line with their ego status. According to the results obtained, there is no statistically significant relationship between the ego status of patients receiving health services and their expectations for joint decision-making. On the other hand, it was concluded that some demographic characteristics of the participants (place of birth, occupation, duration of residence in the same city, chronic disease, psychiatric disease, age, education, number of people living in the same house) have a significant effect on the expectation of joint decision making. In addition, it was determined that those with chronic diseases and those with a history of psychiatric illness had higher expectations of joint decision-making.

Babacan (2021) investigated the attitudes and usage status of patients applying to primary health care organizations regarding traditional and complementary medicine. According to the results of the study, 24.1% of the participants use traditional and complementary medicine. On the other hand, it was determined that those who use traditional and complementary medicine are mostly health professionals and unemployed people and this result is statistically significant. In addition, social media (30.7%) and friends/neighbors (30.4%) are the highest sources of information on traditional and complementary medicine. Among the traditional and complementary medicine methods, phytotherapy and leech treatment are among the results obtained.

Karakaya and Doğan (2021) examined postgraduate theses prepared in the field of primary health care services. In line with the 51 theses evaluated, it was concluded that the studies were generally prepared in the fields of business administration and health management in Istanbul and Ankara. In addition, it is seen that the theses mostly focus on patient and employee satisfaction, health policies and practices.

Altunkan (2022) investigated the effect of pandemic on primary care admissions through a family medicine unit. According to the results of the study, the applications of visiting patients during the pandemic period increased significantly. In addition, the applications made by the 0-24 age group during the pandemic period

decreased significantly compared to the year before the pandemic. The number of community-based cancer screenings also decreased during the pandemic period.

Demir (2022) investigated the utilization of primary health care services by patients. According to the results of the study, it was determined that women applied to family physicians more frequently. In addition, it was also found that increasing education level decreased the rate of visiting a family physician before emergency.

Delice (2023) investigated the manageability of the reasons for the application of patients applying to the orthopedics and traumatology outpatient clinic in primary care. According to the results of the study, participants prefer family health centers in case of illness. However, for orthopedic complaints, they first apply to higher levels. Participants stated that this difference in the case of orthopedic disorders is due to the lack of imaging examinations in family health centers.

Dikmen (2023) evaluated primary health care services in line with their basic qualities and investigated the status of meeting the needs in primary health care services. In the study conducted in Karabük, it was concluded that 16.2% of women had unmet family planning needs, and 77.3% of women did not undergo 15-49 age follow-up. On the other hand, it was determined that 75.8% of women aged 30 years and over had never had a Pap Smear/HPV DNA test and 66.1% of women aged 40 years and over had never had a mammogram. In addition, one out of every three women with any health problem and one out of every ten women with a gynecological/obstetric health problem need unmet health care needs are among the other results obtained.

Oğur (2023) measured quality of life by investigating healthy lifestyle behaviors in primary care. In the study conducted with participants with chronic diseases and over 65 years of age, it was concluded that the increase in income and education level increases the quality of life and healthy lifestyle behaviors. In addition, the number of medications used and chronic diseases decrease with the increase in healthy lifestyle behaviors.

Özkök (2023) evaluated the attitudes and knowledge levels towards traditional and complementary medicine in patients applying to primary health care institutions. According to the results of the study, there is a positive and weakly significant relationship between the knowledge levels of the participants and the sub-dimension of holistic view of health. In addition, within the scope of the sub-dimension of the intellectual view of complementary medicine, the total scores of people who have traditional and complementary medicine practices are statistically higher and significant compared to those who do not.

2. Method, Data Set and Model

The aim of the study is to determine the impact of health supply and demand on health outcomes in primary health care services. Within the framework of this objective, the study analyzed the effect of the number of family medicine units and the number of primary care visits on the number of deaths in the provinces in the Eastern Anatolia Region of Turkey.

It is important to mention detailed information about the Eastern Anatolia Region, which constitutes the universe and sample of the study, in order to create a perspective on the findings and results of the study. According to 2021 data, the total population of the Eastern Anatolia Region is 6,513,106 people. Although Erzurum is the largest province of the region in terms of surface area, Van is the largest province in terms of population. The main source of livelihood in the region is agriculture and animal husbandry (URL 1, 2023). Detailed information on the socio-demographic characteristics of the Eastern Anatolia Region is presented in Table 1.

Table 1. Socio-Demographic Characteristics of Eastern Anatolia Region

	Variables of the Study			Education		Health			
2021	**Number of Family Medicine Units**	**Number of Primary Care Applicants**	**Number of Deaths**	**Number of Illiterate People**	**Number of People Who Can Read and Write but Did Not Finish a School**	**Number of Births**	**Number of Hospitals**	**Number of Hospital Beds**	**Population**

Malatya	280	2.819.615	5.774	34.008	71.336	9.476	19	3.214	808.692
Elâzığ	199	1.733.558	4.334	17.790	64.115	6.986	13	3.164	588.088
Erzincan	75	670.309	1.929	8.545	19.373	2.764	10	710	237.351
Tunceli	31	303.396	696	4.218	5.878	885	6	150	83.645
Bingöl	96	604.267	1.398	12.742	29.743	4.676	8	760	283.112
Muş	126	725.754	1.712	19.873	55.966	9.150	7	770	405.228
Erzurum	272	2.273.368	5.093	30.843	77.154	11.510	21	3.638	756.893
Bitlis	111	570.532	1.454	14.091	44.904	7.624	8	1.065	352.277
Hâkkari	82	401.684	832	9.240	31.323	4.808	5	428	278.218
Van	365	2.398.325	4.260	49.722	169.448	22.646	15	3.030	1.141.015
Ağrı	171	933.956	2.395	27.286	79.266	11.581	9	883	524.644
Iğdır	64	478.320	921	10.234	25.465	3.496	4	313	203.159
Kars	97	675.950	1.579	12.631	28.374	4.397	8	809	281.077
Ardahan	36	271.456	783	4.417	7.956	1.216	3	215	94.932

Source: TÜİK, 2023.

Table 1 presents the socio-demographic characteristics of the Eastern Anatolia Region for the year 2021, as well as data on the variables of the study. In this context, it is thought that statistics on the provinces will be guiding in the interpretation of the findings obtained in the study.

The impact between variables is analyzed using data for the period 2012-2021. This analysis was conducted for 14 provinces in the Eastern Anatolia Region (Malatya, Elâzığ, Erzincan, Tunceli, Bingöl, Muş, Erzurum, Bitlis, Hâkkari, Van, Ağrı, Iğdır, Kars, Ardahan). Information on the research variables is presented in Table 2.

Table 2. Definition of Variables

Variable	Definition	Source	Time
lndeath	Number of Deaths	TÜİK	2012-2021
lnfamily	Number of Family Medicine Units	Ministry of Health	2012-2021
lnapplication	Number of Primary Care Applicants	Ministry of Health	2012-2021

According to various studies conducted in primary health care institutions in Turkey; there is no significant relationship between ego and joint decision-making in benefiting from services (Görgü, 2020: 73), the most difficulties are experienced in 'Immunization Services' (Gezer Çerit, 2007: 1), and the most important role in patient satisfaction is to listen to the patient (Çubukçu, 2008: 39) and physicians having prior knowledge about patients play a role in patient satisfaction (Mutlupoyraz, 2010: 85), people with low levels of health literacy first apply to the emergency room in case of illness (Akpınar, 2019: 43), applications of guest patients increase during the pandemic period (Altunkan, 2022: 12), women apply to family physicians more frequently (Demir, 2022: 33) it has been determined that people with orthopedic disorders first apply to higher levels of health centers, although they first apply to family physicians for other disorders (Delice, 2023: 8). On the other hand, according to a study on access to family health centers, considering the 500-meter distance determined in line with the regulation, it was determined that there were access problems in neighborhoods other than a single neighborhood (Deniz, 2018: 476).

In line with the studies mentioned above, it is thought that the number of primary health care institutions and the applications to these institutions have various effects on the health outcomes of individuals. In this regard, it is predicted that the attitudes and behaviors of individuals play an important role in their health outcomes and thus their mortality. Accordingly, the model to be tested in this study is as follows;

$$\boldsymbol{lndeath_{it} = \alpha_i + \beta_1 lnfamily_{it} + \beta_2 lnapplication_{it} + \epsilon_{it}}$$

First, descriptive statistics will be calculated for the research model. Then, horizontal cross-section dependence will be analyzed using Breusch and Pagan (1980), Pesaran (2004) and Pesaran et al. (2008) tests. After testing the stationarity levels of the variables with CADF unit root analysis and the existence of a long-run relationship with Westerlund and Edgerton (2007) LM bootstrap test, AMG estimators developed by Eberhardt and Teal (2010) will be used to determine the long-run relationship status.

3. Findings

Descriptive statistics for the study model are presented in Table 3.

Table 3. Descriptive Statistics for the Model

	Average	*Maximum*	*Minimum*	*Standard Deviation*	*Skewness*	*Kurtosis*	*Jargue-Bera*
lndeath	7.408660	8.661120	6.169611	0.625564	0.210343	2.051641	6.278780 (0.043)**
lnfamily	4.750322	5.899897	3.218876	0.650014	-0.332279	2.734867	2.986270 (0.224)
lnapplication	13.47202	14.87435	11.73127	0.729869	0.037533	2.455737	1.760835 (0.414)

Note: Values in parentheses denote probability values, while ***, ** and * denote 1%, 5%, and 10% levels, respectively.

When the descriptive statistics values are analyzed, the lndepartment variable has the lowest standard deviation value while the lnapplication variable has the highest standard deviation value. When the variables are evaluated in terms of the skewness coefficient, which expresses the distance of the series from symmetry, the lndepartment and lnapplication variables are skewed to the right, while the lnaile variable is skewed to the left. On the other hand, the degree to which the series differ depending on the normal series height is determined by the kurtosis coefficient. Accordingly, all variables are kurtotic.

The null hypothesis of Jargue-Bera analysis is 'the series are normally distributed' and the alternative hypothesis is 'the series are not normally distributed'. For a normal distribution, the Jargue-Bera probability value should be higher than 0.05 (Teyyare, 2018: 130). When the variables are evaluated in line with the probability values, the alternative hypothesis is rejected for the lnaile and lnapplication variables and it is concluded that the variables are normally distributed. For the lndepth variable, the null hypothesis is rejected and it is determined that the variables are not normally distributed.

3.1. Horizontal Cross Section Dependence Analysis

In studies using panel data analysis, it is necessary to test the possibility of dependence between variables that are thought to potentially affect parameter estimation and inference (Sarafidis and Wansbeek, 2010: 2). Accordingly, in the first stage of the research, a cross-sectional dependence test should be applied to determine the relationship between the variables. These tests play an important role in determining the tests to be used in panel data analysis. In the analysis process of the study, the horizontal cross-section dependence test was first applied to the variables. The results of the horizontal cross-section dependence test are presented in Table 4.

Table 4. Horizontal Cross-Section Dependence Tests

Regression Model: $lndeath_{it} = \alpha_i + \beta_1 lnfamily_{it} + \beta_2 lnapplication_{it} + \epsilon_{it}$	Statistics	p-value
Horizontal cross-section dependence test:		
LM (BP, 1980)	459.334	0.000***
CD_{lm} (Pesaran, 2004)	24.451	0.000***
CD (Pesaran, 2004)	20.604	0.000***
LM_{adj} (PUY, 2008)	19.440	0.000***

Note: ***, ** and * denote 1%, 5% and 10% levels, respectively.

The cross-sectional dependence of the variables is analyzed using the LM test developed by Breusch and Pagan (1980), the CDlm and CD tests developed by Pesaran (2004) and the LMadj test developed by Pesaran et al. (2008). In all of these tests, the null hypothesis is 'there is no horizontal cross-section dependence between the series' and the alternative hypothesis is 'there is horizontal cross-section dependence between the series'.

According to the results of the analysis, since the probability values of LM, CDlm, CD, and LMadj are less than 1% significance level (0.000<0.01, 0.000<0.01, 0.000<0.01, 0.000<0.01 and 0.000<0.01), the null hypothesis of the tests (there is no horizontal cross-section dependence between the series) is rejected. For the case of horizontal cross-section dependence, which is important for the analysis process of the research, the alternative hypothesis 'there is horizontal cross-section dependence between the series' is accepted for all four tests.

The analysis process of the study will continue with the second generation panel data applications that take into account the horizontal cross-section dependence.

3.2. Unit Root Analysis without Structural Breaks

In order to determine the stationarity relationship between the series, CADF unit root test, which is among the second generation unit root tests, was applied to the variables. The null hypothesis of the CADF test developed by Pesaran (2007) is 'there is a unit root' and allows us to test the stationarity of the variables across cross-

sections. Determining the stationarity status of the series is important for determining the cointegration tests to be applied in the rest of the analysis process of the research.

CADF test is applied to series with horizontal cross-section dependence. The test was developed by Pesaran (2007) and its null hypothesis is 'there is a unit root' while the alternative hypothesis is stationarity. CADF test results will be evaluated by taking into account the critical values found in Pesaran's (2007) study. The CADF test results for the number of deaths variable are presented in Table 5.

Table 5. Number of Deaths; CADF Unit Root Test Results

	Constant (Level)		Constant (First Difference)		Constant and Trend	
	Lags	CADF-Test statistics	Lags	CADF-Test statistics	Lags	CADF-Test statistics
lndeath						
Malatya	1	-1.05	1	-1.39	1	-0.98
Elâzığ	1	-1.03	1	-4.27**	1	-3.07
Erzincan	1	-2.07	1	-42.6***	1	-66.69***
Tunceli	1	-0.99	1	-1.79	1	-1.20
Bingöl	1	-3.70**	1	-1.80	1	-3.27
Muş	1	-1.97	1	-6.11***	1	-6.42***
Erzurum	1	-0.64	1	-17.0***	1	-14.15***
Bitlis	1	-0.17	1	-1.21	1	-1.37
Hâkkari	1	-0.18	1	-4.28**	1	-4.75**
Van	1	0.05	1	0.07	1	0.20
Ağrı	1	0.41	1	-0.62	1	-0.09
Iğdır	1	-1.64	1	-6.28***	1	-3.95
Kars	1	-1.39	1	-2.84	1	-1.59
Ardahan	1	-2.72	1	-3.11	1	-1.94
Panel (CIPS)		-1.15		-6.24***		-7.29***

Notes: The maximum lag is assumed to be 2 and is determined according to the Schwarz Information Criteria. The values of the CADF test statistics for the constant model are as follows: -5.73 (1%), -3.96 (5%) and -3.27 (10%) (Pesaran 2007, table I (b), p. 275); for the constant and trend model -7.67 (-6.40) (1%), -4.96 (5%) and -4.27 (10%) (Pesaran 2007, table I (b), p: 275); -7.67 (-6.40) (1%), -4.93 (5%) and -4.00 (10%) for the constant and trend model (Pesaran 2007, table I (c), p: 276). Panel statistics critical values for the fixed model are -2.76 (-2.66) (1%), -2.23 (-2.29) (5%) and -2.18 (-2.15) (10%) (Pesaran 2007, table II (b), p: 280); -3.61 (-3.31) (1%), -3.11 (-2.97) (5%) and -2.89 (-2.78) (10%) for the constant and trend model (Pesaran 2007, table II (c), p: 281). Panel statistics are the average of CADF statistics.

According to the results in Table 5, it is observed that the lndecum variable has a unit root in the model with constant. Accordingly, according to the unit root test applied for the lndecum variable, the model with constant contains a unit root, while the model with constant and trend is stationary. Since the variables are assumed to have long memory, they are assumed to be unit rooted at their level values. When the first difference of the related variable is taken, it is observed that it is stationary in both the fixed and the fixed trend model. In this respect, the alternative hypothesis is accepted in the constant model and in the constant and trend model for the lnmortality variable. The CADF test results for the number of family medicine units are presented in Table 6.

Table 6. Number of Family Medicine Units; CADF Unit Root Test Results

	Constant (Level)		Constant (First Difference)		Constant and Trend	
	Lags	CADF-Test statistics	Lags	CADF-Test statistics	Lags	CADF-Test statistics
lnfamily						
Malatya	1	-1.64	1	-4.52**	1	-3.92
Elâzığ	1	-0.74	1	-11.86***	1	-13.26***
Erzincan	1	-5.55**	1	-454.81***	1	-394.34***
Tunceli	1	-2.70	1	-0.64	1	-0.54
Bingöl	1	-0.36	1	-3.86*	1	-3.50
Muş	1	-3.30**	1	-21.86***	1	-29.10***
Erzurum	1	1.01	1	-0.13	1	-0.36
Bitlis	1	-2.61	1	-0.06	1	-0.32
Hâkkari	1	-0.50	1	-0.32	1	-0.31
Van	1	-1.11	1	-9.68***	1	-7.49**
Ağrı	1	-0.81	1	-7.32***	1	-8.74***
Iğdır	1	-1.03	1	-0.84	1	-0.94
Kars	1	2.20	1	0.82	1	1.30
Ardahan	1	-0.97	1	-1.18	1	-1.02
Panel (CIPS)		-1.40		-34.56***		-30.98***

Notes: The maximum lag is assumed to be 2 and is determined according to the Schwarz Information Criteria. The values of the CADF test statistics for the constant model are as follows: -5.73 (1%), -3.96 (5%) and -3.27 (10%) (Pesaran 2007, table I (b), p. 275); for the constant and trend model -7.67 (-6.40) (1%), -4.96 (5%) and -4.27 (10%) (Pesaran 2007, table I (b), p: 275); -7.67 (-6.40) (1%), -4.93 (5%) and -4.00 (10%) for the constant and trend model (Pesaran 2007, table I (c), p: 276). Panel statistics critical values for the fixed model are -2.76 (-2.66) (1%), -2.23 (-2.29) (5%) and -2.18 (-2.15) (10%) (Pesaran 2007, table II (b), p: 280); -3.61 (-3.31) (1%), -3.11 (-2.97) (5%) and -2.89 (-2.78) (10%) for the constant and trend model (Pesaran 2007, table II (c), p: 281). Panel statistics are the average of CADF statistics.

According to Table 6, lnaile variable is found to have a unit root in the model with constant. Accordingly, according to the unit root test applied for the lnaile variable, the constant model contains a unit root, while the constant and trend model is stationary. Since the variables are assumed to have long memory, they are assumed to be unit rooted at the level value. When the first difference of the lnaile variable is taken, it is seen that both the constant and the constant trend model are stationary. Therefore, the alternative hypothesis is accepted for the lnaile variable in the constant model and in the constant and trend model. The CADF test results for the number of first-line applications are presented in Table 7.

Table 7. Number of First-Tier Applications; CADF Unit Root Test Results

	Constant (Level)		Constant (First Difference)		Constant and Trend	
	Lags	CADF-Test statistics	Lags	CADF-Test statistics	Lags	CADF-Test statistics
lnapplication			1			
Malatya	1	-0.62	1	-10.49***	1	-11.15***
Elâzığ	1	0.64	1	-0.05	1	0.36
Erzincan	1	-2.39	1	-1.30	1	-1.73
Tunceli	1	-3.86**	1	-8.99***	1	-11.97***
Bingöl	1	-0.26	1	-1.01	1	-1.31
Muş	1	-1.31	1	-8.97***	1	-7.67***
Erzurum	1	-0.35	1	-1.82	1	-1.49
Bitlis	1	-2.10	1	0.32	1	0.55
Hâkkari	1	-2.06	1	-2.11	1	-1.83
Van	1	-1.60	1	-0.89	1	-0.50
Ağrı	1	-2.16	1	-3.54*	1	-3.82
Iğdır	1	-1.63	1	-17.73***	1	-16.30***
Kars	1	-2.90	1	-0.65	1	-0.77
Ardahan	1	-1.46	1	-0.99	1	-1.00
Panel (CIPS)		-1.52		-4.12**		-4.11***

Notes: The maximum lag is assumed to be 2 and is determined according to the Schwarz Information Criteria. The values of the CADF test statistics for the constant model are as follows: -5.73 (1%), -3.96 (5%) and -3.27 (10%) (Pesaran 2007, table I (b), p. 275); for the constant and trend model -7.67 (-6.40) (1%), -4.96 (5%) and -4.27 (10%) (Pesaran 2007, table I (b), p: 275); -7.67 (-6.40) (1%), -4.93 (5%) and -4.00 (10%) for the constant and trend model (Pesaran 2007, table I (c), p: 276). Panel statistics critical values for the fixed model are -2.76 (-2.66) (1%), -2.23 (-2.29) (5%) and -2.18 (-2.15) (10%) (Pesaran 2007, table II (b), p: 280); -3.61 (-3.31) (1%), -3.11 (-2.97) (5%) and -2.89 (-2.78) (10%) for the constant and trend model (Pesaran 2007, table II (c), p: 281). Panel statistics are the average of CADF statistics.

When the results for the lnbasvuru variable are compared according to the critical values, it is determined that the constant model contains a unit root, while the constant and trend model is stationary. When the first difference of the variable is taken, it is determined that the lnbasvuru variable is stationary in the fixed model. Accordingly, the alternative hypothesis is accepted within the scope of the constant model and the constant and trend model for the lnbasvuru variable.

3.3. Panel Cointegration Analysis without Structural Breaks

Cointegration analysis is performed to determine whether the variables move together in the long run. Cointegration is tested with the help of Westerlund and Edgerton (2007) analysis. The cointegration test results are presented in Table 8.

The LM_N^+ test was developed by Westerlund and Edgerton (2007). What makes this test different from other cointegration tests is that the null hypothesis of the test is 'there is cointegration' and the alternative hypothesis is 'there is no cointegration'. The presence of horizontal cross-sectional dependence between the series in the study prevents the interpretation of the values found in the asymptotic distribution in cointegration analysis.

Therefore, the results of the analysis are interpreted depending on the bootstrap value. According to the results of the analysis, the null hypothesis is accepted at 10% significance level in the fixed model.

Table 1. Panel Cointegration Test Without Structural Breaks

	Constant			Constant and Trend		
Test	Statistics	Asimptotik p-değeri	Bootstrap p-değeri	Statistics	Asimptotik p-değeri	Bootstrap p-değeri
LM bootstrap						
LM_N^+	3.374	0.000	0.962*	38.534	0.000	0.454

Notes: Bootstrap probability values are obtained from the distribution with 1,000 replications. Asymptotic probability values are from the standard normal distribution. ***, ** and * indicate 1%, 5% and 10% levels, respectively.

3.4. Estimation of Long Run Cointegration Coefficients without Structural Breaks Eberhardt and Teal (2010) AMG Analysis

The cointegration test provides information on the direction and rate of the relationship between variables. Accordingly, the analysis process of the study will continue with the AMG estimator that takes into account horizontal cross-section dependence. The long-run estimation results for the number of family medicine units variable using AMG (2010) panel cointegration estimators are presented in Table 9.

Table 9. Number of Family Medicine Units; Long Run Estimation with AMG (2010) Panel Cointegration Estimators

	Eberhardt ve Teal (2010) AMG		
	Coefficient	t-value	p
lnfamily			
Malatya	0.2354	-1.58	0.11
Elâzığ	-0.6025	-1.27	0.20
Erzincan	-0.4792	-0.46	0.64
Tunceli	0.0315	0.07	0.94
Bingöl	-0.8928	-1.64	0.10
Muş	-0.0320	-0.07	0.94
Erzurum	-0.2286***	-1.97	**0.04**
Bitlis	-0.0694	-0.53	0.59
Hâkkari	0.2336	0.85	0.39
Van	-0.5555***	-5.01	**0.00**
Ağrı	-1.9990***	-3.55	**0.00**
Iğdır	-0.2138	-0.96	0.33
Kars	-0.1691	-1.42	0.15
Ardahan	-0.0412	-0.10	0.92
Panel	-0.3549***	-2.55	**0.01**

Notes: t statistic is the Newey-West standard error of varying variance. ***, ** and * denote 1%, 5% and 10% levels, respectively.

In the analysis process of the study, the existence of a long-run relationship between the series was determined based on the test results conducted earlier. The AMG estimator developed by Eberhardt and Teal (2010) was used to estimate the coefficients of the relationship between the series.

For the model tested in the study, it was determined that there were significant differences across the panel and provinces. The interpretation of the significant results obtained is important in terms of making an interpretation for the Eastern Anatolia Region in general.

In the case where the magnitude of the number of family medicine units and the number of deaths is tested, according to the AMG estimator, a 1% increase in the number of family medicine units leads to a 0.22% decrease in the number of deaths in Erzurum. However, this result is statistically significant ($p<0.05$). In terms of surface area, Erzurum is the largest province in the Eastern Anatolia Region. In addition, it has the highest number of hospitals and beds in the region. Therefore, Erzurum is a province in demand in the Eastern Anatolia

Region in terms of health services. The demand characteristic of Erzurum plays an important role in people's knowledge and awareness of health services. This situation directs health services and thus shapes health outcomes. In this respect, it is predicted that the result regarding the decrease in Erzurum may be related to the aforementioned issues.

According to the AMG estimator, a 1% increase in the number of family medicine units leads to a 0.55% decrease in the number of deaths in Van. Van is the most populous province in the Eastern Anatolia Region in terms of population. Van is in a good position among the provinces evaluated in terms of health services and ranks first in terms of the number of births. According to the results of the analysis, the result regarding the decrease in deaths in Van is an indication that health services are effectively managed and directed in this province, which has the highest number of births in the region. Therefore, it is thought that the result may be related to the mentioned issues.

A 1% increase in the number of family medicine units causes a 1.99% decrease in the number of deaths in Ağrı. Individuals living in Ağrı generally utilize health services in Erzurum, either through referral or preference. The characteristics of Erzurum compared to other provinces in its region play a role in its preference and have an impact on the health outcomes of the population it addresses. Therefore, it is thought that the result obtained in Ağrı may be due to Erzurum's health services and health knowledge.

In addition to all findings, a 1% increase in the number of family medicine units across the panel leads to a 0.35% decrease in the number of deaths. The family medicine practice, which was designed with the Health Transformation Program and started as a pilot practice in 2004, makes important contributions in directing health outcomes. In this context, positive effects on Turkey's health outcomes have been achieved in line with early diagnosis and treatment as well as preventive health services. The result obtained for the overall panel on mortality rate supports this positive effect.

The results of the long-run estimation of the number of primary care admissions variable using AMG (2010) panel cointegration estimators are presented in Table 10.

Table 10. Number of Primary Care Admissions; Long Run Estimation with AMG (2010) Panel Co-integration Estimators

	Eberhardt ve Teal (2010) AMG		
	Coefficient	t-value	p
lnapplication			
Malatya	0.2444***	2.22	**0.02**
Elâzığ	0.2487	1.59	0.11
Erzincan	0.1229	0.67	0.50
Tunceli	0.0796	1.15	0.25
Bingöl	0.1263	0.68	0.49
Muş	-0.2979***	-1.98	**0.04**
Erzurum	0.0771	1.29	0.19
Bitlis	0.1258***	3.09	**0.00**
Hâkkari	-0.1768**	-1.88	**0.06**
Van	0.0649	1.14	0.25
Ağrı	-0.0476	-0.24	0.81
Iğdır	0.1206	0.59	0.55
Kars	0.0528	0.91	0.36
Ardahan	0.0023	0.01	0.99
Panel	0.0363	0.90	0.36

Notes: t statistic is the Newey-West standard error of varying variance. ***, ** and * denote 1%, 5% and 10% levels, respectively.

According to Table 10, significant results were obtained for some provinces. Accordingly, a 1% increase in the number of primary care admissions leads to a 0.24% increase in the number of deaths in Malatya. Malatya is neighboring the Mediterranean and Central Anatolia Regions due to its location. It is thought that this neighborliness may have an impact on Malatya's health literacy level. On the other hand, although Malatya is not at the top in terms of population and number of hospitals compared to other provinces, it ranks first in terms of the number of family medicine units and the number of primary care applications. This is one of the indicators that Malatya is in a leading position in terms of the level of knowledge on health services. The level of knowledge that individuals have can also play a role in directing and managing their health services. This situation may negatively affect health outcomes. Therefore, it is thought that the result may be related to the mentioned issues.

According to the AMG estimator, a 1% increase in the number of primary care admissions leads to a 0.29% decrease in the number of deaths in Muş. Muş ranks last among the provinces evaluated in the study in terms of the number of hospitals. This situation plays an important role in the referral system and preferences for health institutions in different provinces. Utilizing health services in different provinces may affect health outcomes positively or negatively. As a matter of fact, the result obtained supports the idea of positive effect.
A 1% increase in the number of primary care visits causes a 0.12% increase in the number of deaths in Bitlis. There is no training and research hospital in Bitlis. This situation directs individuals to neighboring provinces in case of need for tertiary health care services. On the other hand, the number of illiterate and illiterate people in Bitlis is high. Low level of education may have a negative impact on individuals' orientation and management of health services. In this respect, it is predicted that the result obtained regarding the increase in the number of deaths may be related to the mentioned issues.
A 1% increase in the number of primary care admissions in Hakkari leads to a 0.17% decrease in the number of deaths. Although Hâkkari is a province with geographical difficulties, it ranks last among the provinces in the region in terms of the number of hospitals. This situation directs the people residing in Hâkkari to the neighboring provinces for some services (health, education, etc.) in line with their income level. It can be said that directing the demands for health services to health institutions with better qualifications prepares the ground for positive effects on the health outcomes of individuals, and the result obtained supports this positive effect.

4. Conclusion and Recommendations

In this study, which tests the impact of health supply and demand on health outcomes with panel data analysis, provinces in the Eastern Anatolia Region are evaluated. The Eastern Anatolia Region has difficult geographical conditions. On the other hand, when socio-demographic characteristics are analyzed, it is a region with relatively low levels of education and high levels of births. It is thought that there may be differences in the health levels of the region, whose main source of livelihood is agriculture and animal husbandry, and the study was carried out.
According to the results of the research, a 1% increase in the number of family medicine units causes a decrease of 0.22% in Erzurum, 0.55% in Van and 1.99% in Ağrı on the number of deaths variable, as well as the overall panel. It is expected that there will be positive effects on health outcomes and thus a decrease in the number of deaths through family physicians. However, in addition to socio-demographic characteristics, health perceptions play an important role in the way people direct health services and thus manage their health. It is thought that the result of the decrease in Erzurum, Van and Ağrı may be due to these factors as well as the socio-demographic characteristics of individuals.
A 1% increase in the number of primary care visits leads to a 0.29% decrease in Muş, a 0.17% decrease in Hakkari, a 0.24% increase in Malatya and a 0.12% increase in Bitlis. Effective management and orientation of the tier system has a positive impact on health outcomes. In addition to early diagnosis and treatment, primary health care services are of great importance in shaping the level of health. In this context, it is considered that health services are managed effectively in Muş and Hakkari where there are decreases. On the other hand, in Malatya and Bitlis, where there are increases, it is predicted that the results achieved may be due to differences in the level of knowledge and awareness of people. In this direction, it is thought that effective results can be achieved through correct guidance.
Based on the results obtained from the study, the following suggestions can be made for future studies;

- By determining the level of health literacy in Malatya and Bitlis, the impact of this level on health outcomes can be investigated.
- Accessibility to family physicians in the Eastern Anatolia Region can be investigated.
- The health perception level of the Eastern Anatolia Region can be determined and studies can be carried out to increase the level.

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Etik, Beyan ve Açıklamalar

1. Etik Kurul izni ile ilgili;

☑**.**Bu çalışmanın yazar/yazarları, Etik Kurul İznine gerek olmadığını beyan etmektedir.

2. Bu çalışmanın yazar/yazarları, araştırma ve yayın etiği ilkelerine uyduklarını kabul etmektedir.

3. Bu çalışmanın yazar/yazarları kullanmış oldukları resim, şekil, fotoğraf ve benzeri belgelerin kullanımında tüm sorumlulukları kabul etmektedir.

4. Bu çalışmanın benzerlik raporu bulunmaktadır.